

HIGH SENSITIVITY SCANNING PROBE SYSTEM

ABSTRACT

The present invention provides a hybrid optical and interferometric atomic force microscope system (40) for monitoring a cantilever probe (46). A light source (42) provides a light beam which is focussed on the back of the cantilever probe (46). The light reflected off the probe is split into two beams of different path lengths and are recombined to form an interference beam (58). This interference beam (58) is passed through a grating (102) having substantially the same period and orientation as the interference beam pattern. The light transmitted through the grating (102) illuminates a photodetector (122) to give a signal according to the intensity of the light falling on the photodetector. The photodetector output signal is sent to a positioning system (126), which in turn gives a signal to the piezoelectric system (54) so that the probe (46) follows the sample (50) surface. This signal is integrated as a function of position across the scanned area to represent a characteristic of the sample surface. An array of light beams, cantilever probes and photodetectors are also provided, and a plurality of characteristics may be obtained by performing a single scan on the sample surface. Actuators are also provided on the grating (102) and mirrors in the interferometer (60, 60a, 60b) to modulate the fringes of the interference beam (58) and cancel out noise in the microscope system (40).